

# Use of resorbable magnesium screws in children: systematic review of the literature and short-term follow-up from our series

Andreas Rehm, Luke Granger, and Elizabeth Ashby

We read with interest the above publication by Baldini et al.<sup>1</sup> Scherer et al.<sup>2</sup> used the biodegradable MAGNEZIX<sup>®</sup> implant for fixation of medial humeral epicondyle fractures in 2 children and stated that absorbable implants are increasingly used in the treatment of pediatric fractures in order to avoid a second operation for metal removal.

This is not supported by the recent systematic review of medial humeral epicondyle fracture management by Pezzutti et al.,<sup>3</sup> with none of the 37 included studies having reported the use of resorbable implants and the vast majority of metal screws used in children aged 11–14 years not having been removed.

Baldini et al.<sup>1</sup> claimed that routine removal of implants in skeletally immature patients is usually recommended, particularly to avoid interference with growth and therefore also promoted the use of the MAGNEZIX<sup>®</sup> implant to avoid a second operation. Loder and Feinberg<sup>4</sup> reported in contrary to the former that implant removal is controversial, based on a survey of 273 pediatric and 99 non-pediatric American orthopedic surgeons, where 41% indicated that they removed stainless steel implants most or all of the time, 36% sometimes, and 22% almost never or never, with growth interference not having been raised at all as a concern.

Baldini et al.<sup>1</sup> concluded that resorbable Magnesium (Mg) implants are safe and effective in orthopedic and traumatology procedures in skeletally immature patients. We would like to ask the authors<sup>1</sup> why they did not provide any supporting outcome data for their conclusion, such as data from outcome questionnaires, functional recovery over time, and/or return to sportive activities from neither the 19 adult and the one publication including potentially skeletally immature patients listed in their systematic review nor for their own 14 cases?

Baldini et al.<sup>1</sup> stated that only one of their patients had a complication (detachment of a screw head) and recorded for another patient who had fixation of a patella fracture with 3 MAGNEZIX<sup>®</sup> implants that the patient was only

able to do fitness training in a gym at 18 months, without being able to do any other sport. The inability to return to sport could be related to part of all 3 screws being outside the cortical bone (which the authors stressed to avoid), potentially causing chondrolysis in addition to the extensive osteolysis seen around the screws, which would weaken the bone.

The lack of outcome data does not support Baldini et al.'s<sup>1</sup> claim that Mg screws guarantee stable fixation with good clinical and radiological results, with the inability of the latter case to return to sport contradicting the authors'<sup>1</sup> claim.

Similar osteolysis around MAGNEZIX<sup>®</sup> implants is visible on radiographs presented in other publications,<sup>2,5,6</sup> which might not be reversed until about 6–12 months after surgery.<sup>5,6</sup> Such extensive lysis would increase the risk to sustain a stress fracture around the implant, probably stopping children from participating with contact sport.

Jungesblut et al.<sup>5</sup> presented radiographic and magnetic resonance imaging (MRI) images of 5 osteochondral defects (1× talar dome; 4× femoral condyle) in adolescents out of 19 cases where MAGNEZIX<sup>®</sup> implants were used, which in our opinion show osteolysis around the implants, partial osteochondral fragment disintegration, a lack of osseointegration, and lack of restoration of the osteochondral anatomy, in contrary to the authors'<sup>5</sup> claim that complete healing occurred in 12 cases. The former authors did not report Patient-Reported-Outcome-Measurement-Information-System (PROMIS) or functional outcome scores.

Department of Paediatric Orthopaedics, Cambridge University Hospitals NHS Trust, Cambridge, UK

**Corresponding Author:**

Andreas Rehm, Cambridge University Hospitals NHS Trust, Hills Road, Cambridge CB2 0QQ, UK.  
 Email: [leoreporting@yahoo.co.uk](mailto:leoreporting@yahoo.co.uk)



In summary, we have concerns about the use of Mg implants in skeletally immature patients because of the extensive osteolysis caused by these implants, which would limit return to contact activities over extended periods and the possible detrimental effect of such lysis on small osteochondral fragments and therefore have doubts about Baldini et al.'s<sup>1</sup> conclusion that such implants are safe and effective in skeletally immature patients.

#### Author contributions

All authors contributed to literature review and manuscript preparation.

#### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

#### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

#### References

1. Baldini M, Coppa V, Falcioni D, et al. Use of resorbable magnesium screws in children: systematic review of the literature and short-term follow-up from our series. *J Child Orthop* 2021; 15(3): 194–203.
2. Scherer S, Dietzel M, Jordan N, et al. Changes in the management of pediatric medial humeral epicondyle fractures with and without associated elbow dislocation. *Injury* 2021; 52: 2257–2264.
3. Pezzutti D, Lin JS, Singh S, et al. Pediatric medial epicondyle fracture management: a systematic review. *J Pediatr Orthop*. Epub ahead of print 14 February 2020. DOI:10.1097/BPO.0000000000001532.
4. Loder RT, Feinberg JR. Orthopaedic implants in children: survey results regarding routine removal by the pediatric and nonpediatric specialists. *J Pediatr Orthop* 2006; 26: 510–519.
5. Jungesblut OD, Moritz M, Spiro AS, et al. Fixation of unstable osteochondritis dissecans lesions and displaced osteochondral fragments using new biodegradable magnesium pins in adolescents. *Cartilage* 2020; 3: 302S–310S.
6. Stürznickel J, Delsmann MM, Jungesblut OD, et al. Safety and performance of biodegradable magnesium-based implants in children and adolescents. *Injury* 2021; 52(8): 2265–2271.